

In re application of Yang and Liu
Application No.: 10/626,008
Page 14 of 21

Atty. Dkt. No. QUANT1400 (028248-3501)

REMARKS

In accordance with the present invention, it has been discovered that conductive inks incorporating maleimide, nadimide, and/or itaconimide-containing resins exhibit advantageous shelf life, short curing and drying times, and low curing and drying temperatures. In addition, conductive inks of the present invention have good screen printability, high temperature stability, good cohesive strength and chemical resistance, and good adhesion to copper substrates. The invention further provides methods for using such conductive inks to produce capacitors and provide stable electrical connections with printed circuit boards.

By the present communication, claims 1, 23, 24, 26-28 and 30 have been amended, and new claim 39 has been added, to define Applicants' invention with greater particularity. No new matter is introduced by the subject amendments as the amended claim language is fully supported by the specification and original claims. In view of the amendments submitted herewith, claims 2, 3 and 10 have been cancelled without prejudice.

Upon entry of the amendments submitted herewith, claims 1, 4-9 and 11-39 will be pending in this application. A detailed listing of all claims that are, or were, in the application, irrespective of whether the claim(s) remain under examination in the application, is presented herewith, beginning on page 2, along with an appropriate status identifier.

The provisional rejection of claims 1-38 under the judicially created doctrine of obviousness-type double patenting as allegedly being unpatentable over claims 14, 18 and 22 of copending Application No. 10/342,143, is respectfully traversed. Applicants' invention, as defined, for example, by amended claim 1, distinguishes over '143 by requiring a conductive ink comprising:

- (a) a defined quantity of a thermally curable resin system comprising
 - (i) one or more of a maleimide, nadimide, or itaconimide,
 - (ii) a comonomer selected from a defined group of crosslinkable compounds, and
 - (iii) a catalyst;

In re application of Yang and Liu
Application No.: 10/626,008
Page 15 of 21

Atty. Dkt. No. QUANT1400 (028248-3501)

wherein the weight ratio of the one or more maleimide, nadimide, itaconimide, or combination/comonomer/catalyst in the resin system falls within a defined range;

- (b) a defined quantity of a particulated electrically conductive material;
- (c) optionally, an organic solvent; and
- (d) a defined quantity of at least one additional component selected from the group consisting of flow additives, adhesion promoters, rheology modifiers, electrical enhancers, stabilizers, and mixtures of any two or more thereof.

'143 does not disclose, teach or suggest such a material.

Applicants respectfully disagree with the Examiner's oversimplified comparison between the present claims and the claims of '143, i.e., "both the instant claims and the above listed claims of S.N. 10/342,143 are drawn to electrically conductive compositions containing a maleimide compound and a free-radical initiator." See page 3, lines 1-3 of the Office Action. The above-quoted language ignores the specific requirements of the present claims which uniquely define a composition useful as a conductive ink (e.g., the specific components and acceptable ratios thereof), as opposed to the die attach pastes taught by '143. Those of skill in the art readily understand there to be a significant difference between conductive inks (typically having low viscosity to facilitate handling in the unique context where these materials are employed) and die attach materials (which typically exist in the form of pastes).

Accordingly, reconsideration and withdrawal of the provisional rejection under the judicially created doctrine of obviousness-type double patenting over copending Application No. 10/342,143 are respectfully requested.

The provisional rejection under the judicially created doctrine of obviousness-type double patenting is not applicable to new claim 39 as claim 39 distinguishes over '143 by requiring a conductive ink comprising:

- (a) a thermally curable resin system comprising

In re application of Yang and Liu
Application No.: 10/626,008
Page 16 of 21

Atty. Dkt. No. QUANT1400 (028248-3501)

- (i) one or more maleimides, nadimides, or itaconimides of defined structure,
 - (ii) optionally, a comonomer, and
 - (iii) a catalyst;
- (b) a particulated electrically conductive material; and
 - (c) optionally, an organic solvent.

'143 does not disclose, teach or suggest such a material.

The rejection of claims 1-38 under 35 U.S.C. § 102(b) as allegedly being anticipated by, or in the alternative, under 35 U.S.C. § 103(a) as allegedly being obvious over Dershern et al. (U.S. Patent No. 6,034,195) is respectfully traversed.

Initially, Applicants note that in order to anticipate a claim, a single publication or event must provide each and every element set forth in the claim. "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). "The identical invention must be shown in as complete detail as is contained in the . . . claim." *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989). See also MPEP §2131.

Moreover, to establish a *prima facie* case of obviousness, three criteria must be met; there must be some motivation or suggestion, either in the cited reference(s) or in knowledge available to one skilled in the art, to modify the cited reference(s); there must be a reasonable expectation of success in combining (or modifying) the reference(s) to achieve the claimed invention; and the reference(s) must teach or suggest all of the claim limitations. *In re Vaeck*, 20 USPQ2d 1438 (Fed. Cir. 1991); MPEP § 2143.

Applicants' invention, as defined, for example, by amended claim 1, distinguishes over Dershern et al. by requiring a conductive ink comprising:

- (a) a defined quantity of a thermally curable resin system comprising:
 - (i) one or more of a maleimide, nadimide, or itaconimide,

In re application of Yang and Liu
Application No.: 10/626,008
Page 17 of 21

Atty. Dkt. No. QUANT1400 (028248-3501)

- (ii) a comonomer selected from a defined group of crosslinkable compounds, and
- (iii) a catalyst;
 - wherein the weight ratio of the one or more maleimide, nadimide, itaconimide, or combination/comonomer/catalyst in the resin system falls within a defined range;
- (b) a defined quantity of a particulated electrically conductive material;
- (c) optionally, an organic solvent; and
- (d) a defined quantity of at least one additional component selected from the group consisting of flow additives, adhesion promoters, rheology modifiers, electrical enhancers, stabilizers, and mixtures of any two or more thereof.

Dershem et al. do not disclose, teach or suggest such a material.

Dershem is similar to '143 discussed above in that the disclosure is directed to die attach pastes. As noted above, those of skill in the art readily understand there to be a significant difference between conductive inks (typically having low viscosity to facilitate handling in the unique context where these materials are employed) and die attach materials (which typically exist in the form of pastes).

Since Dershem et al. fails to provide each and every element of the subject claims, Dershem et al. cannot anticipate the claims. Moreover, Dershem et al. cannot render the claims obvious as the reference fails to disclose, teach or suggest the conductive ink formulations required by the present claims. Accordingly, reconsideration and withdrawal of the rejections under 35 U.S.C. § 102(b) and 35 U.S.C. § 103(a) over Dershem et al. are respectfully requested.

The rejection under 35 U.S.C. § 102(b) as allegedly being anticipated by, or in the alternative, under 35 U.S.C. § 103(a) as allegedly being obvious over Dershem et al. is not applicable to new claim 39 as claim 39 distinguishes over Dershem by requiring a conductive ink comprising:

- (a) a thermally curable resin system comprising:

DLMR_275306.2

In re application of Yang and Liu
Application No.: 10/626,008
Page 18 of 21

Atty. Dkt. No. QUANT1400 (028248-3501)

- (i) one or more maleimides, nadimides, or itaconimides of defined structure,
 - (ii) optionally, a comonomer, and
 - (iii) a catalyst;
- (b) a particulated electrically conductive material; and
- (c) optionally, an organic solvent.

Dershem does not disclose, teach or suggest such a material.

The rejection of claims 1-38 under 35 U.S.C. § 102(b) as allegedly being anticipated by, or in the alternative, under 35 U.S.C. § 103(a) as allegedly being obvious over Ikeguchi et al. (U.S. Patent No. 4,552,690) or Cassat (U.S. Patent No. 4,756,756) is respectfully traversed.

Applicants' invention, as defined, for example, by amended claim 1, distinguishes over Ikeguchi and Cassat by requiring a conductive ink comprising:

- (a) a defined quantity of a thermally curable resin system comprising
 - (i) one or more of a maleimide, nadimide, or itaconimide,
 - (ii) a comonomer selected from a defined group of crosslinkable compounds, and
 - (iii) a catalyst;
wherein the weight ratio of the one or more maleimide, nadimide, itaconimide, or combination/comonomer/catalyst in the resin system falls within a defined range;
- (b) a defined quantity of a particulated electrically conductive material;
- (c) optionally, an organic solvent; and
- (d) a defined quantity of at least one additional component selected from the group consisting of flow additives, adhesion promoters, rheology modifiers, electrical enhancers, stabilizers, and mixtures of any two or more thereof.

Neither Ikeguchi nor Cassat disclose, teach or suggest such materials. Instead, Ikeguchi, for example, is directed to substantially different materials, i.e., resin compositions containing

In re application of Yang and Liu
Application No.: 10/626,008
Page 19 of 21

Atty. Dkt. No. QUANT1400 (028248-3501)

cyanate esters as the major component thereof. While invention compositions require the presence of comonomer, none of the comonomers contemplated by the present claims are cyanate ester. Instead, the present claims contemplate the presence of comonomers such as (meth)acrylate, epoxy, vinyl ether, vinyl ester, vinyl ketone, vinyl aromatic, vinyl cycloalkyl, allyl amide, or combination of any two or more thereof.

Similarly, Cassat is directed to substantially different materials, i.e., insulating inks comprising a non-conductive metallic oxide extender. In contrast, the invention compositions require the presence of particulated electrically conductive material.

Applicants' invention, as defined, for example, by claim 31, further distinguishes over Ikeguchi and Cassat by requiring a conductive ink formulation consisting essentially of:

- (a) a defined quantity of a thermally curable resin system comprising
 - (i) one or more of a maleimide, nadimide, or itaconimide,
 - (ii) optionally, a comonomer, and
 - (iii) a catalyst;
 - wherein the weight ratio of the one or more maleimide, nadimide, or itaconimide/comonomer/catalyst in the resin system falls within a defined range;
- (b) a defined quantity of a particulated electrically conductive material;
- (c) optionally, an organic solvent; and
- (d) a defined quantity of at least one additional component selected from the group consisting of flow additives, adhesion promoters, rheology modifiers, electrical enhancers, stabilizers, and mixtures of any two or more thereof.

The transitional "consisting essentially of" language of this claim clearly excludes the presence of such components as the cyanate ester of Ikeguchi (which is the major feature thereof) and the non-conductive metallic oxide extenders of Cassat (which is a key feature of the Cassat formulations). Therefore, neither Ikeguchi nor Cassat disclose, teach or suggest the conductive ink formulations required by the present claims. Moreover, Ikeguchi and Cassat are incapable of disclosing or suggesting the above-described formulations since neither reference discloses,

In re application of Yang and Liu
Application No.: 10/626,008
Page 20 of 21

Atty. Dkt. No. QUANT1400 (028248-3501)

teaches or suggests the thermally curable resin system required by the present claims, in combination with electrically conductive material.

Accordingly, reconsideration and withdrawal of the rejections under 35 U.S.C. § 102(b) and 35 U.S.C. § 103(a) over Ikeguchi or Cassat are respectfully requested.

The rejection under 35 U.S.C. § 102(b) as allegedly being anticipated by, or in the alternative, under 35 U.S.C. § 103(a) as allegedly being obvious over Ikeguchi et al. or Cassat is not applicable to new claim 39 as claim 39 distinguishes over both Ikeguchi and Cassat by requiring a conductive ink comprising:

- (a) a thermally curable resin system comprising
 - (i) one or more maleimides, nadimides, or itaconimides of defined structure,
 - (ii) optionally, a comonomer, and
 - (iii) a catalyst;
- (b) a particulated electrically conductive material; and
- (c) optionally, an organic solvent.

Neither Ikeguchi nor Cassat disclose, teach or suggest such materials.

DLMR_275306.2

In re application of Yang and Liu
Application No.: 10/626,008
Page 21 of 21

Atty. Dkt. No. QUANT1400 (028248-3501)

In view of the above amendments and remarks, it is respectfully submitted that the present application is now in condition for allowance. Accordingly, reconsideration and favorable action on all claims are respectfully requested. In the event any matters remain to be resolved in view of this communication, the Examiner is encouraged to call the undersigned so that a prompt disposition of this application can be achieved.

Respectfully submitted,

Date September 26, 2005

By Stephan E. Reiter

FOLEY & LARDNER LLP
Customer Number: 30542
Telephone: (858) 847-6711
Facsimile: (858) 792-6773

Stephen E. Reiter
Attorney for Applicants
Registration No. 31,192

DLMR_276306.2